Title: Patterns in Literature

Brief Overview:

This unit uses children's literature to teach students to copy, identify, extend, describe, and create patterns. The students will use a variety of tasks and work in both cooperative groups and independently to display their understanding of patterns and relationships.

Links to NCTM 2000 Standards:

- **Standard 1: Number and Operation**
  Mathematica instruction programs should foster the development of number and operation sense so that all students understand numbers, ways of representing numbers, relationships among numbers, and number systems.

- **Standard 2: Patterns, Functions, and Algebra**
  Mathematica instruction programs should foster the development of number and operation sense so that all students understand patterns and their relationships; use symbolic forms to represent and analyze mathematical situations and structures; and use mathematical models and analyze change in both real and abstract contexts.

- **Standard 6: Problem Solving**
  Mathematics instruction programs should foster the development of number and operation sense so that all students; build new mathematical knowledge through their work and problems; develop a disposition to formulate, represent, abstract, and generalize in situations within and outside mathematics; apply a wide variety of strategies to solve problems and adapt the strategies to new situations; and monitor and reflect on their mathematical thinking in solving problems.

- **Standard 7: Reasoning and Proof**
  Mathematics instruction programs should foster the development of number and operation sense so that all students recognize reasoning and proof as essential and powerful parts of mathematics**;** make and investigate mathematical conjectures; develop and evaluate mathematical arguments and proofs; and select and use various types of reasoning and methods of proof as appropriate.

- **Standard 8: Communication**
  Mathematics instruction programs should foster the development of number and operation sense so that all students organize and consolidate their mathematical thinking to communicate with others; express mathematical ideas coherently and clearly to peers, teachers, and others; extend their mathematical knowledge by considering the thinking and strategies of others; and use the language of mathematics as a precise means of mathematical expressions.

- **Standard 9: Connections**
  Mathematics instruction programs should foster the development of number and operation sense so that all students recognize and use connections among different mathematical ideas; understand how mathematical ideas build on one another to produce a coherent whole; and recognize, use and learn about mathematics in contexts outside of mathematics.

- **Standard 10: Representation**
  Mathematics instruction programs should foster the development of number and operation sense so that all students create and use representations to organize, record and communicate mathematical ideas; develop a repertoire of mathematical representations that can be used purposefully, flexibility, and appropriately; and use representations to model and interpret physical, social and mathematical phenomena.

Grade/Level:

Grade 3

Duration/Length:

4-5 class periods

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Basic whole number operations
- Recognizing geometric shapes and colors of pattern blocks

Student Outcomes:

Students will:

- copy, identify, describe and extend geometric and numeric patterns.
- create patterns when given a description and develop descriptions to complete a chosen pattern.
- use appropriate math language to describe patterns.
- relate patterns to real world situations, i.e., literature.

Materials/Resources/Printed Materials:

- Unifix cubes
- Pattern blocks
- Crayons

- Overhead blocks
- Books: *Goldilocks and the Three Bears* by Jan Brett*;*,*Caps For Sale* by Esphyr Slobodkina*; Old McDonald's Farm* by Michelle Knudsen*; Math Counts Patterns* by Henry Pluckrose
- Paper towel tube
- Construction paper
- Teacher Resource Sheet 1
- Student Resource Sheets 1-4

Development/Procedures:

Task 1: Understanding Basic Patterns

Introduce patterns and relationships by asking children to make a journal entry listing everything they know about patterns.

***Teacher Note: It is a good idea to place a piece of chart paper on the board for each unit and label it <u>Math Talk</u>. This would be a location where all the vocabulary associated with the unit should be written and displayed for the children to use in both oral and written discussions.**

After appropriate wait time, allow children to share their responses and past experiences. Lead discussion and discovery on patterns they have seen in everyday life. Can you see them? Hear them? Smell them? Feel them?

Continue lesson by reading *Math Counts Patterns* by Henry Pluckrose or any other book about patterns.

Discuss and provide/demonstrate several simple patterns seen everyday. (Example: checker/chess board, zebras, rhythm and movement patterns...)

Demonstrate a simple rhythmic pattern (example: clap, clap, snap, clap, clap, snap...) and have children copy. Then guide discussion eliciting from the children other ways this pattern can be represented, leading them to pattern blocks, Unifix cubes, etc. (Example: triangle, triangle, square, triangle, triangle, square,..., red, red, blue, red, red, blue...)

Demonstrate the pattern again and show equivalent pattern using overhead pattern blocks. Have a volunteer create another repeating pattern and write it on the board. Have children use pattern bocks to represent new pattern. Share findings.

Choose a student's correct representation of the pattern and demonstrate it on the overhead. Ask the students to copy and repeat pattern three times in cooperative groups. Do the same on overhead. Explain meaning of words *core and term.*

<u>Core</u> - The portion of the pattern that repeats.
<u>Term</u> - The individual units that make up the pattern.

Teacher should have students copy terms and definitions into their math journals. Create an additional pattern with a repeated core on the overhead. (example: triangle rhombus, square, triangle, rhombus, square...) Ask students to copy pattern using pattern blocks. Have students create three more terms.

Using this pattern, write letters A, B, C under each of the terms in the core pattern. Discuss how the letter can now represent the pattern. Create another pattern using additional terms (example: square, square, triangle, triangle, trapezoid, rhombus) and have a volunteer assign a letter to the pattern (A, A, B, B, C, D) or you may wish to demonstrate.

Ask students to name other ways they can describe this pattern? Color? Terms? Shape? Core? Etc...

Closure - As a whole group, elicit input from the students and model writing a paragraph to describe this pattern. Focus on appropriate math language and vocabulary.

Task 2: Patterns in Literature

Day 1: Monkey Say, Monkey Do

This activity involves the students working with Unifix cubes to identify and label the core pattern.

Begin by telling students that they will be looking for patterns in well-known literature.

Read the story ***Caps for Sale*** by Esphyr Slobodkina and as each color group of hats is identified, teacher and students will begin to copy the corresponding pattern with the Unifix cubes.

Distribute Unifix cubes to students.

Discuss with the class the type of core pattern being built (Actual pattern used in book: A,B,B,B,B,C,C,C,C,D,D,D,D,E,E,E,E...) Ask: "If the pattern was repeated, what would be the next term (refer to definition from previous lesson)?" Encourage students to continue to build this pattern three additional times.

Ask: What color would the 16th hat be? How do you know?

Give students a sheet of construction paper and a hat pattern for tracing shapes. Allow them to create a hat pattern with a repeated core for the peddlar to wear and label it showing the terms.

***Teacher Note - It is recommended that the children write their responses to the following activity. They should be encouraged to use math talk/language in their responses. You may also wish to provide a simple rubric for reference. (Example: a 3 response may include the following: written in a clear and orderly sequence, correct math talk is used, the question is answered, and responses are supported.)**

Using an empty paper towel tube, and a connected group of Unifix cubes, begin slowly pulling the patterned cubes out of the tube until one and one half of the core pattern is displayed. Ask what the pattern is. (Example: A,B,B,C,C) Have students predict the next color that would be displayed if you continued pulling. What would the 25th color be? Challenge students to explain reasons for their answers.

Optional Enrichment Activity: Distribute additional paper towel tubes and Unifix cubes to pairs of students. Allow students to take turns emulating the demonstration activity.

Task 2: Patterns in Literature

Day 2: Who's Been Eating My Porridge?

This activity involves working with pattern blocks, cooperative learning, and problem solving.

Begin by reminding students that they will be continuing to look for patterns in well-known literature.

Read *Goldilocks and the Three Bears* by Jan Brett to the students. Tell students that Goldilocks and the three bears have been called together to help us develop patterns. Students will then identify all the patterns they hear in the story so the teacher can record them on the board. Together, teacher and students will identify and label the core patterns and the terms.

Students will then be grouped in cooperative groups of four students. Each group will be given a set of four cards (Student Resource Sheets 1-3). Tell students that they should read their cards to their group, in any order, but may not show them to one another. They must then build the pattern according to directions.

Once students have successfully built their pattern, distribute a second set and have them follow the same procedure.

After each group has successfully completed both sets of pattern sheets, distribute pattern blanks. Tell students they are to create their own set of directions to make a new pattern. Tell them you will be exchanging these newly created pattern directions between the cooperative groups.

Math Writing Extension - Have students take 5 minutes to write in their journals what they have learned about patterns since the first lesson. Attention should be paid to math talk/language.

***Teacher Note - Teacher should be informally assessing student's writing on a daily basis. This can be accomplished through teacher observation and discussion.**

(Additional problems such as these may be found in Cooperative Problem Solving with Pattern Blocks, by Ann Roper. Creative Publications.)

Performance Assessment: Old McDonald's Barn by Michelle Knudsen

Begin by reading the classic children's story Old McDonald's Farm.

***Teacher Note - It is recommended that each student be given a piece of drawing paper on which to draw their barns. You may wish to read the prompt aloud and/or have the students read independently.**

Present the following prompt:

Old McDonald needs a new barn for his noisy animals. Cows, roosters, pigs, horses**,** ducks and sheep will be housed here. You have been hired to develop the pattern that will be used to build the stables in the new barn. The pattern you design must follow all of the following rules. Check the boxes once you have followed the rule. Answer the questions once you have completed your barn pattern. See attached assessment sheets.

Extension/Follow Up:

- Additional activities involving patterns can be found in *Cooperative Problem Solving with Pattern Blocks,* by Ann Roper. Creative Publications)

- The following is a list of other well-known stories such that can be used in the classroom to further extend discussions and understanding of patterns:

Fleischman, Paul *Joyful Noise: Poems for Two Voices*. New York; Harper and Row, 1988.
Galdone, Paul. *Three Billy Goats Gruff*. Boston; Houghton Mifflin, 1987**.**
Wood, Audrey. *The Napping House*. San Diego, CA: Harcourt Brace Jovanovich, 1984.

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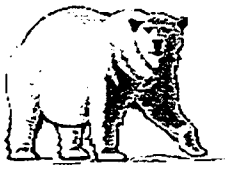
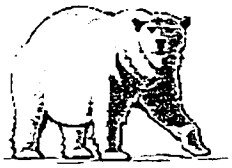
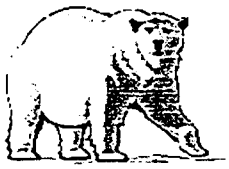
Task 2, Day 2

Red is the first color in the core. 	The colors used are red, blue, green and yellow. 
There are 8 pattern pieces in all. 	Two of the pieces are the same color. 

Task 2, Day 2

This pattern core repeats 3 times. 	The colors are tan, orange and green. 
The last core color is green. 	A green block must not be next to a tan block. 

Task 2, Day 2

OLD MCDONALD'S BARN

Old McDonald needs a new barn for his noisy animals. Cows, roosters, pigs, horses**,** ducks and sheep will be housed here. You have been hired to develop the pattern that will be used to build the stables in the new barn. The pattern you design must follow all of the following rules. Check the boxes once you have followed the rule. Answer the questions once you have completed your barn pattern.

RULES

- ☐ **Animals must be in a continuous pattern going from left to right in rows to fill the entire barn.**
- ☐ **The duck is always the first animal in the core pattern.**
- ☐ **The rooster cannot be next to the duck (too noisy!).**
- ☐ **The sheep are lonely and need to be in pairs (stables next to each other).**
- ☐ **The cows cannot be next to the horses (they do not like each other).**

QUESTIONS

1) Using the animal names, describe the core pattern.

_____

2) Using letters of the alphabet, describe the core pattern.

_____

3) What animal is in the 3rd term _____?

4) What animal is in the 20th term _____? Explain your reasoning.

_____

SCORING RUBRIC FOR OLD MCDONALD'S FARM

5 Points

~ All 5 rules were followed and all boxes are checked.
~ All 4 questions were answered correctly.
~ Math talk is used in explanation on questions 1, 2, and 4 (not required for 3).
~ Work is neat and organized.

4 Points

~ 4 of 5 rules were followed and all boxes are checked.
~ 3 of 4 questions were answered correctly.
~ Math talk is used in explanation on 2 of the 3 questions.
~ Work is neat and organized.

3 Points

~ 3 of 5 rules were followed and all boxes are checked.
~ 2 of 4 questions were answered correctly.
~ Math talk is used in explanation on 2 of the 3 questions.
~ Work is neat and organized.

2 Points

~ 2 of 5 rules were followed and some boxes are checked.
~ 1 of 4 questions were answered correctly.
~ Math talk is used in explanation on 1 of the 3 questions.
~ Work is somewhat neat and organized.

1 Points

~ 1 of 5 rules were followed and some boxes are checked.
~ 1 of 4 questions were answered correctly.
~ Math talk is not used.
~ Work is somewhat neat but may not be organized.

0 - Points

~ No response evident